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THE DIAGNOSIS AND TREATMENT OF KIDNEY STONE.

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IN 1880 Henry Morris performed the first nephrolithotomy, the removal of a stone from a useful functionating kidney, one not the seat of destructive suppurative processes.

Before this time the few kidney stone operations were nephrotomies or nephrectomies done on suppurating kidneys the seat of extensive destructive processes.

The diagnosis of kidney stone was, at the time of Morris's first case, extremely difficult and uncertain. The diagnosis of the condition is, to-day, with the aid of newer and more refined means, made with a considerable degree of certainty. The diagnosis was formerly made and the treatment undertaken when the symptoms were extremely grave and the damage done to the urinary organs by the condition was serious and often irreparable. The diagnosis should be and can usually now be made long before the symptoms are extreme and the destructive effects of the disease great. The treatment was formerly expectant unless the symptoms were threatening the life of the patient, and then surgical operation was adopted as a last resort. The treatment to-day should be early removal of the stone as soon as the diagnosis can be established, and if possible before serious injury has occurred to the kidney or ureter. The exception to this rule is of course to be found in the cases where organic lesions in other organs, extreme age, etc., make the surgical procedure distinctly more dangerous than the continuance of the condition.

The etiology of kidney stone is still cloudy. The most probable explanation of stone formation is to be found in the theory of catarrhal inflammation of the renal mucosa of germ origin, usually colon or typhoid as in gall stones. The source of infection is probably from the blood, as a rule. The ascending inflammation from the bladder as a cause of stone formation would seem to be the exception.

In connection with stone formation the very common occurrence of stone in the kidney or bladder after fracture of the spine is an interesting and suggestive fact. In these cases we frequently have colon bacillus cystitis and pyelitis due to the loss of function of the bladder with resulting damming back of the urine, the use of the catheter and subsequent infection. The urinary infarcts and uric acid deposits of the new born must not be overlooked as a factor in the kidney stones of the young; traumatism as a possible factor must be considered. A number of cases with history of traumatism, hematuria and later kidney stone have been reported.

The relationship of other pathological processes in the urinary organs to stone, such as the co-existence of stone and tuberculosis, stone and malignant disease of the kidney, and stone in the kidney associated with tuberculosis or carcinoma of the bladder or prostate is not clearly understood. Such cases are frequently observed. A certain relationship between gouty and allied diatheses, and kidney stone seems established, and in this same connection must be mentioned the existence of the same hereditary tendency to kidney stone as to the diatheses.

From an analysis of our own cases it seems that the most essential and most common cause of kidney stone, without denying other possibilities, is a mild colon infection of the kidney which furnishes both the nucleus and the organic framework and the conditions which favor the deposit of the inorganic substances from the urine which go to form the complete kidney stone.

The division of stones into primary and secondary is of some clinical importance. The primary stones are those developed in a kidney secreting fairly normal urine. The secondary are developed in a kidney containing decomposing urine.

The clinical picture of kidney stone colic is well known and easily recognized. It is due to a plugging up of the ureter with

stone or pus or blood with resulting sudden great increase of intra-renal tension and great pain. Such a renal colic with its sudden onset and sudden relief, with its characteristic pain radiating from the kidney down the ureter and to the genitals with later the passage of a small stone per urethram, make the diagnosis as clear as a mathematical demonstration. Some physicians demand this unmistakable picture before making the diagnosis of stone.

As a matter of fact these cases are as rare as the typical gall stone case with characteristic colic, jaundice and the finding of the stones in the feces are in gall stone work. And if we look for these typical pictures alone we shall overlook as many kidney stones as the old time physicians did who did not make gall stone diagnosis unless jaundice was present.

Without minimizing the value of the gross clinical picture of kidney stone colic, it should be borne in mind that many cases of kidney stone are found and can be diagnosed with symptoms which have little resemblance to this old fashioned picture.

Kidney stone is less common than gall stones but no reliable reports as to their relative frequency of occurrence are at hand.

In some countries 80% of cases occur below the age of 20; apparently in others the majority occur above 40. They are generally found in most statistics to be much more common in male than female. There are some exceptions to this rule, some operators having more female than male cases. The statement found in some text-books that females form but 5% of the cases is entirely erroneous. In Israel's work there were more females than males, and in Kümmell's there were 22 females out of 47 cases. In our own work the females furnish about 25% of the cases.

Kidney stones are found in less than 1% of our post mortems, less than 1/10 as frequent as gall stones which occur in 10% of all post mortems.

CLINICAL COURSE

1. Kidney stone may, like gall stone, remain innocuous for years, give absolutely no symptoms.

2. Kidney stone may give rise to the typical acute colics above described.

3. Kidney stone may give rise to acute attacks resembling gall stone colic or attacks of appendicitis or of acute indigestion or even of ileus.

4. Symptoms of lumbago or sciatica may be present.

5. Symptoms of pyelitis with pus and blood.

6. Gross hemorrhages discovered by the patient with secondary anemia, blood clots in bladder, etc.

7. Calculous anuria.

8. Stone with enlargement of the kidney mistaken for tumor, especially if the condition is associated with hemorrhage.

9. Stone with pus, blood and emaciation, a picture suggestive of tuberculosis.

10. Stone may be found associated with tuberculosis.

11. Stone may be found associated with neoplasm.

DIAGNOSIS

The diagnosis of kidney stone must be made from the following:

(1) A careful analysis of the family history, the personal history, and the gross clinical evidence of the case.

(2) Character of the pain and other symptoms, tenderness over kidney and ureter.

(3) Examination of the centrifuged urine for microscopic amounts of blood, traces of albumen, tubercle bacilli, etc.

(4) Cystoscopic examination to exclude bladder lesions and to ascertain condition of ureteral orifices.

(5) Catheterization of the ureters to determine the presence of two ureters and two functionating kidneys and collecting and examining the separate urines.

(6) Cryoscopic examination of the blood to determine the functional capacity of the kidneys.

(7) Exhaustive X-ray examination to determine the presence of stone in the kidneys, ureter or bladder.

The varieties of stone are:

1. Oxalate and urate stones.
2. Phosphatic and carbonate stones.
3. Cystine, xanthin and indigo stones.

In addition to the general symptoms—temperature, pulse, pain, tenderness and tumor, fixed or movable, information of much value in diagnosis may be obtained by the employment of the following procedures:

(a) Microscopic examination of sediment. The centrifuge and microscope have made it possible for us to determine the presence of small numbers of red blood corpuscles, tubercle bacilli, pus and epithelial cells, etc.

(b) The X-ray skillfully employed is a valuable addition to the field of kidney surgery. Skiagraphs showing good differentiation are capable of showing the presence of stones in the kidney and ureter with a high degree of accuracy, even when the stones are largely composed of uric acid or urates. Skiagraphs that are reliable for diagnostic purposes according to Albers-Schönberg, should possess the following characteristics:

1. The transverse processes of the vertebrae should be distinctly shown.

2. The psoas muscle must be outlined at its outer border so that it may be distinguished from the quadratus lumborum.

3. The last two ribs with their structure should be plainly shown.

Leonard who has done more work with X-ray as a means of diagnosis in renal and ureteral calculi than anyone else in this country, regards the negative finding equally as reliable as the positive, provided negatives of good quality are secured and points out the fact that the plates to be reliable must be of such a quality that "shadows of objects less dense than the least dense calculus" must be shown upon the plate. He has also shown that nearly one-half of all calculi occur in the ureters. In the cases in which the evidence obtained by the skiagraph is negative, it was pointed out by one of the present writers in *Annals of Surgery,* May, 1904, that tuberculosis, hypernephroma, cystic kidney, tumors, etc., may give rise to symptoms not to be differentiated clinically from the picture of stone in the kidney. In two recent cases in which the patient's symptoms, i. e., pain, tenderness, etc., were on one side, the X-ray showed the shadow of a calculus in the opposite ureter which was found and removed by operation. These cases show

that the clinical symptoms may be entirely misleading in regard to the location of the stone when one is present.

In regard to the technic to be employed and the kind of apparatus to be used operators differ widely—so widely in fact that the conclusion may readily be drawn that good results depend more upon the individual skill of the operator than upon the apparatus employed. Some workers employ large coils capable of giving a spark of 15 to 20 inches excited by 110 or 220 volt currents; others employ coils of only 6 to 10 inches spark length excited by low voltage currents. Both methods are capable of producing good results if properly employed. One consideration upon which nearly all operators agree is that the tube employed should be of rather low vacuum in order to secure the necessary differentiation of structures. The length of exposure varies with the kind of apparatus employed and the thickness of the patient from a few seconds to ten minutes or more.

In general it is best to secure a skiagraph of the entire region of the kidneys, ureter and bladder by some such method as that shown in Fig. 1. The patient lies on his back with head elevated and thighs flexed upon the abdomen so as to bring the back as nearly in uniform contact with the plate as possible. In case a suspicious shadow is shown on the plate, one or more additional plates should be made to eliminate the possibility of error due to defective plates, unequal development, etc. In case of doubt as to the character of the shadow the apparatus of Albers-Schönberg, shown in Fig. II., may be employed. This apparatus consisting of a heavy lead cylinder with a diaphragm at the top serves by its weight to compress the area, thereby diminishing the thickness of the parts, and securing immobilization of the intra-abdominal organs. The diaphragm cuts off practically all except parallel rays and the resulting negatives are much more clear and distinct.

The interpretation of the plates requires a considerable amount of intelligent experience. In examining the plates, which are always far more reliable than prints made from them, it is best to examine the plates by strong transmitted light reflected from the sky or some white surface. The suggestion of Kümmell as to the use of opera glasses in the examination of X-ray plates is a good one. The observer stands at a distance of 10 to 12 feet from the plates and observes them with a pair of opera glasses by

transmitted sky light. The field of the glasses cuts off outside objects and gives a very clear view.

(c) The ureteral catheter and segregator are of great value in determining whether one or both kidneys are involved, by collecting the separate urines for examination. The segregator of Harris is easily employed in both male and female patients and often gives the necessary evidence. Catheterization of the ureters, although often more difficult, sometimes impossible, is far more reliable. Recent improvements in instruments for catheterizing the ureters make possible the more general employment of the valuable means of diagnosis. The cystoscope is of great value in differentiating bladder and kidney lesions. In many cases by examination of the ureteral orifices and the character of the urine discharged from them, it is possible to determine which kidney is diseased.

(d) Cryoscopy, though not yet generally employed, is of great value in determining the renal efficiency in kidney diseases. The normal freezing point of human blood is—0.56° C. If there is insufficient elimination of solids by the kidneys, these solids are retained in the blood, lowering its freezing point to —0.60° or lower. The freezing point is determined by withdrawing eight or ten cubic centimeters of blood from a vein with a sterile syringe and freezing it in a vessel surrounded by chopped ice and salt and reading the freezing point upon a thermometer with a specially graduated scale. A high concentration of the blood and a consequent lowering of the freezing point to —0.60° C. indicates a high grade of renal insufficiency, and that operative procedures, especially those involving kidney tissue, are highly dangerous. In renal affections in which the freezing point of the blood is —0.56° C. we may be fairly sure that but one kidney is involved and that renal competency is present.

(e) Inflation of the colon is of great value in distinguishing tumors of the kidney from swellings involving other organs such as the spleen, liver, gall bladder, ovary, etc. The inflated colon should lie in front of the kidney, which is a retro-peritoneal organ, while it will lie behind swellings involving the spleen and liver and will surround swellings of the pelvic organs such as the uterus and ovaries. Although this is a valuable test it is not always to be relied upon because in some cases the colon is dis-

placed by the kidney swelling so that it gives, on inflation, the same relations as would a distended gall bladder.

(f) Finally, exploratory operation must occasionally be resorted to in spite of our newer and more accurate means of diagnosis. It is safe to say that at least 10% of all kidney operations are to be regarded as exploratory. Neoplasms will be found at operation in cases where the diagnosis of tuberculosis or other inflammatory condition has been made, and vice versa. Although it should be the aim of the surgeon to reduce these cases to the fewest possible, there will always remain a certain number of doubtful cases in which exploratory operation must be resorted to as a final means of diagnosis.

TREATMENT

The question of treatment may be discussed under three heads.

(a) The treatment by expectant and bloodless measures. This method of treatment should be limited to those cases (1) in which the rather infrequent attacks are comparatively mild in character and in which the size of the stone as shown by the X-ray is such as to lead to the reasonable hope of a spontaneous passage of the stone; (2) in which other conditions, such as age, lesions in other organs, etc., make the operative removal of the stone more serious than the continuance of the condition; (3) in which a stone of rather small size lies quiescent in the lower portion of the ureter. In these cases glycerine internally, injections of liquid vaseline into the ureter as suggested by Kolischer is the treatment of choice and often gives satisfactory results.

(b) The treatment of calculus anuria is rapid nephrotomy under nitrous oxide or Schleich's infiltration anæsthesia. If necessary double nephrotomy may be done in cases in which both kidneys are involved. Tedious operations for permanent removal of the cause of the obstruction should be postponed until the patient has recovered from the effects of the anuria. Often, of course, when the stone is in the pelvis of the kidney, it can be removed at the primary operation.

The fantastic suggestion that in cases of anuria the operation

of stripping the fibrous capsule from the kidney should be resorted to, seems to have no sound pathological basis and should be severely condemned.

(c) The surgical removal, except in the two classes of cases just enumerated, is to be regarded as the treatment of choice in all cases in which a definite diagnosis of renal calculus can be made. Not only should surgical treatment be advised but it should be insisted upon, and the patient warned of the dangers of delay. A renal calculus of ordinary size, diagnosed early, before suppuration and destruction of renal parenchyma has taken place, can be safely removed with little danger to the kidney function and small probability of recurrence. On the other hand, although kidney stones as well as gallstones may remain innocuous for years, yet almost invariably, sooner or later, infection occurs about the stone, resulting in serious damage to the kidney function. The mortality of nephrolithotomy performed upon a non-suppurating kidney is not more than 3% and the kidney is saved. The mortality of the same procedure after suppuration is over 10% and often nephrectomy is necessary before the suppuration comes to an end. Nephrolithotomy is one of the most satisfactory operations in surgery, and in early uncomplicated cases, easy of execution.

An essential to good work on the kidney is an incision which gives free access to the organ with little danger of post operative hernia, the minimum of damage to the abdominal wall, and the least possible danger of complication, such as peritonitis, etc. The incision which best meets these requirements is one which begins a finger's breadth below the last rib at a point where the erector spinal muscle crosses the rib and extends obliquely downward and outward to a point a finger's breadth above the ilium. For most cases it need not extend beyond the center of the crest. In cases where additional space is needed to remove a large stone or to expose the ureter, the incision can be extended downward a finger's breadth above the crest as far as the internal inguinal ring, dividing if necessary the flat muscles of the abdominal wall in the line of the incision. In cases where smaller incisions will suffice, the external oblique, internal oblique, and tranversalis muscles may be split in the direction of their fibres as in the muscle-splitting

incision for appendicitis. The peritoneum should be pushed forward out of the line of incision and should not be opened in the absence of special indications for opening the cavity. If desired, free exposure of the peritoneal cavity may be made by opening the peritoneum external to the colon and intra-abdominal operations such as removal of the appendix, drainage of pancreatic cysts, etc., can be readily carried out.

This oblique lumbar incision answers best for almost all kidney operations. It meets the essential requirements of avoiding the peritoneum, of giving free access to the kidney, and of carrying little danger of post operative hernia. Three other incisions may be employed with advantage in certain special cases: (1) A less oblique or rather almost a straight incision extending from the last rib to the crest of the ilium along the outer border of the quadratus lumborum muscle can be used in a simple nephrotomy or nephropexy., (2) A median incision for a transperitoneal ureterotomy. (3) A parasacral or vaginal incision for the removal of a stone in the vesical portion of the ureter.

After the incision has been made sufficiently large and extended to the fatty capsule of the kidney, the latter is opened and the kidney freely exposed and brought out of the external wound so that it is under complete control. In the absence of extensive adhesions this can be readily accomplished. If reliable X-ray plates show a single stone in the renal pelvis, the posterior wall of the pelvis should be incised, the stone removed, and the opening in the pelvis closed with a row of catgut Lembert sutures. If the stone is of large size or if it is branched and irregular, occupying the calices, or if the X-ray has not given satisfactory evidence as to the size, location and number of stones present, then instead of opening the renal pelvis, an incision should be made along the convex border of the kidney, a little to one side of the median line and parallel to the long axis of the kidney, splitting the kidney through the calices into the pelvis. The bleeding can be readily controlled by making digital pressure on the renal artery. The stone or stones should be removed, taking great care that no stones or fragments are allowed to remain. Still maintaining digital pressure on the renal artery, the incision in the kidney is closed with good sized interrupted catgut sutures, deeply placed to con-

PLATE I—To Illustrate Article by Dr. Arthur D. Bevan and Dr. Joseph F. Smith.

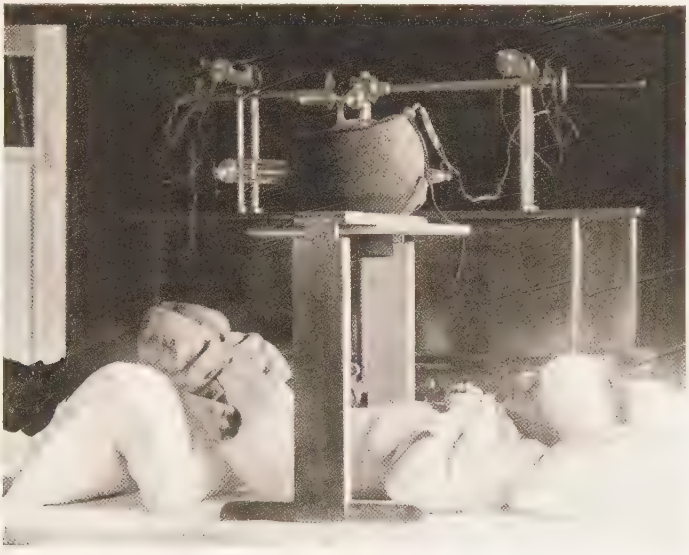

FIG. 1.

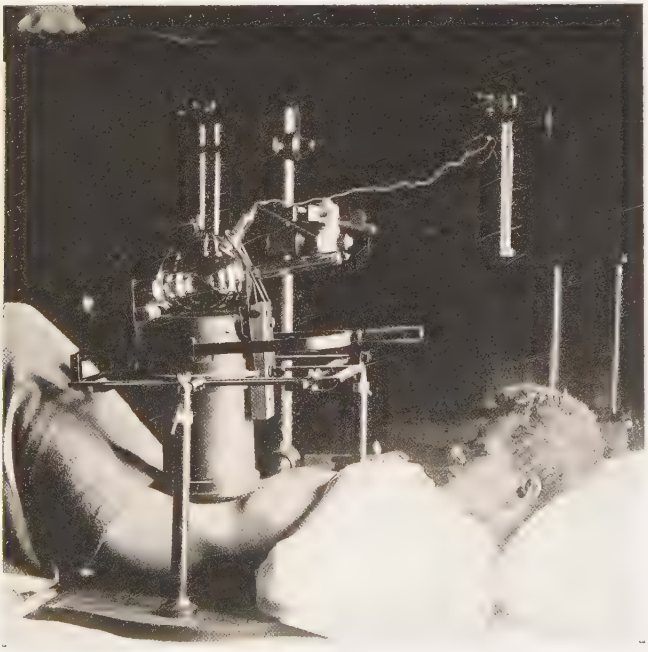

FIG. 2.

PLATE II—To Illustrate the Article by Dr. Arthur Dean Bevan and Dr. Joseph F. Smith.

trol hemorrhage. Superficial interrupted catgut sutures are inserted between the deep sutures in order to accurately coapt the edges of the cut fibrous capsule. The kidney is then dropped back, the fatty capsule closed with fine interrupted catgut sutures and the external wound closed with deep buried catgut sutures in the muscles and through and through silkworm gut sutures leaving a space in the middle of the wound for the insertion of a cigarette drain which is carried down to the wound in the kidney to provide drainage for any urinary leakage or oozing that may occur. This drain is removed after 48 hours. In the majority of cases there is little or no tendency to urinary leakage even when the pelvis of the kidney has been opened. In eighteen nephrotomies for stone we have had no deaths. One case died following a nephrectomy for the cure of a suppurating sinus following a nephrotomy for the removal of calculi from a suppurating kidney. This patient had at the time of the first operation an extensive pyelitis and perinephritic abscess and is an excellent argument against delay and in favor of early operation for the removal of renal calculi.

DESCRIPTION OF PLATES.

PLATE I. FIG. 1.—Apparatus arranged for taking a general view of kidney region. Tube inclosed in tube-shield, supported upon a circular lead plate with an opening 3 inches in diameter. To the left is the edge of a lead screen with plate glass window for protection of operator.

FIG. 2. Albers-Schönberg apparatus for making negatives of a small area in doubtful cases.

PLATE II.—Typical X-ray picture showing single stone in the right kidney.

GONORRHOEAL INFECTION OF THE URETHRAL FOLLICLES AND DIVERTICULA.

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AMONG complications of gonorrhoea there are some which frequently are passed by unnoticed, not because they are unknown to physicians, but because they appear at first sight a very simple affair, and especially for the reason that the patient, in many cases, is not greatly disturbed by their presence, and neglects calling his physician's attention to them. I refer to inflammation of the gland follicles of the urethra, glans and prepuce and to acquired or congenital diverticula, which accompanies or follows gonorrhoea.

Many cases of these complications have already been recorded, but it would appear that specialists alone have called attention to these facts. It, however, is to be wished that these complications of gonorrhoea should be constantly borne in mind, because many cases of chronic urethritis are, in point of fact, kept up by a latent infection of an unrecognised diverticulum or a follicle. It is certain that, in these cases, the treatment of chronic gonorrhoea will remain fruitless, because the diseased structure is not directly treated. From this, successive reinoculations of the urethral canal and the eclosion of other more serious complications arise which might have been avoided, if it had been possible, in all cases of gonorrhoea, to make a careful and rigid examination.

As far back as 1860, Diday, in an article published in the *Gazette hebdomadaire de médecine et de chirurgie*, drew attention to a complication of gonorrhoea at that time little known, namely a case of a mucous follicle of the meatus which had become infected and gave issue to a drop of pus through a narrow opening situated on the border of the meatus. A year later in the same journal, Lagneau related the same condition in two patients, the lesions being seated on the side of the frenum, forming two

small rounded and resistant tumors which gave exit to a little pus through a small opening. Borel, in 1880, and Geortiades in 1889, have recorded instances of periurethral fistula which had as an undeniable cause a gonorrhoeal folliculitis. Touton, Jadassohn, Fabry and Feleki have recorded cases of the same nature. In 1894 Audry published a very interesting study of the complications of gonorrhoea which we are now considering, in the *Journal des maladies cutanées et syphilitiques;* in this paper he considers this complication as very frequent, because at the time of writing he had found 9 instances out of 350 patients examined. In 1902 the same authority made a careful histological examination of the walls of a paraurethral abscess which developed during a gonorrhoea. Still more recently, Sellei has published a very complete article on the pathogenesis of gonorrhoeal infection of the paraurethral canals.

Before undertaking the study of the etiology and pathogenesis of these gonorrhoeal complications, it does not appear to me superfluous to give a summary description of the structure of the urethral mucosa, as well as that of the glans and prepuce.

The urethral mucosa is composed of two layers, the first being epithelial in nature and composed of several layers of cells; the superficial ones are cylindrical or cubic, the deeper ones being polygonal. Secondly, a chorion composed of dense connective tissue including numerous elastic fibres which frequently are anastomosed between themselves.

Towards the third month of intrauterine life, epithelial buds develop from the deeper aspect of the epithelium and become imbedded in the chorion. These buds give rise to Méry's and Cooper's glands, to the prostate and to Littré's glands. The latter are submucous and secrete a thin mucus; they are composed of a prismatic epithelium and a membrane; they are disseminated along the entire length of the urethra and their excretory ducts may attain 0.002 to 0.005 mm. in length in the spongy portion. Other follicles are to be found which are nothing more or less than Littré's glands, but only incomplete; in point of fact, they are simple culs-de-sac, rarely subdivided into two or three lobes; their seat is intramucous. Besides Littré's glands and follicles other culs-de-sac may be seen to freely open through the mucosa. Morgagni, who first discovered them, divided them, according to

their dimensions, into foramina and foraminula, and considered that they were seated in the upper lateral portions of the urethra. They are to be found from Guerin's valve down to the membraneous portion of the canal, and they empty into the urethra by a rounded or elliptical orifice after running under the mucosa over the extent of from 6 to 7 mm. In one case recorded by Cruveiller the duct measured 27 mm. These lacunæ of Morgagni may be considered as simple depressions in the urethral mucosa.

The mucosa of the prepuce continues without any line of demarcation with the skin covering the penis and from the histological standpoint it presents the same structure as the latter. A few slight differences allow one to distinguish one from the other; the epithelial layers are more scanty, while hair and sudoriparous glands are absent. As to the sebaceous glands, to which the formation of the smegma proeputialis has been attributed, and is in reality a simple epithelial desquamation, they certainly exist, but are absolutely rudimentary.

The mucosa of the glans belongs to the dermo-papillary type of polystratified epithelium, with a connective and elastic tissue stroma and comprises the glands discovered by Tyson in 1680 in the orang-outang; he called them odoriferous glands, but they are better known under the name of Tyson's glands. The existence of these glands has been denied by many authorities and defended by many others; Cooper, Littré, Duverney, Burckart, Kolliker admit that they exist, while this is denied by Morgagni, Haller, Valentin, Thomsa, Finter, Bergonzini, Stieda and Sprunck.

It should be added that very frequently the excretory ducts of Tyson's glands, and in certain cases, those of Littré's glands, are considerably hypertrophied in length and thus form true diverticula. But the word diverticulum is especially applied to congenital or acquired canals due to malformation of the meatus and the anterior extremity of the urethra. Janet has described them admirably in his article on the microbic hiding places of the urethra and I feel compelled to give a very short summary of his article. He divides them into paraurethral diverticula and urethral diverticula properly speaking, that is to say, developed in the interior of the urethral canal. The former are congenital

malformations and consist of blind canals, usually seated in the glans, around and just below the meatus. Those seated in the neighborhood of the frenum are composed by the hypertrophied duct of a Tyson's gland. The second are also congenital in origin and are due to the narrowness of the meatus; they are pockets, or lateral folds, which are simply formed by a folding of the urethral mucosa. The lacunæ of Morgagni and Littré's glands are also capable of forming more or less deep diverticula.

These few notions relative to the structure of the urethral mucosa and that of the prepuce and glans having been given, it will be an easier matter to approach the pathogenesis of the complications of gonorrhoea that we have in view.

The etiological study is represented by a single word—gonorrhoea. I will leave aside all types of urethritis which are not due to the gonococcus; they are pathological curiosities, are of very short duration and as yet it is not known whether they can give rise to inflammation of the follicles.

Everybody is willing to admit the gonorrhoeal nature of these inflammatory processes arising in the follicles and diverticula. In two cases Pellizari found the gonococcus in a pure state, while in a third he found it combined with the staphylococcus. In Bockhart's case the staphylococcus alone was found. In the case of a young man, Christiani found Neisser's diplococcus in a pure culture. Fabry bases himself on two cases in order to uphold that the gonococcus alone can give rise to a catarrhal inflammation, and that the ordinary pyogenic bacteria can cause it to become suppurative. Touton says that in some cases the gonococcus is to be incriminated, while in others the saprophytes of the urethra are in play. Staugiale has recorded three cases—in the first one he found the gonococcus alone, in the second it was associated with the staphylococcus albus, while in the third it was combined with staphylococcus aureus. In seven cases related by Thivrier he was always able to find the gonococcus, but he did not look for other pyogenic organisms. And lastly, in the case to be reported in this paper, the examination of the pus coming from a diverticulum, which was made by Dr. Rimbaud, revealed the gonococcus.

One may consequently conclude from all these cases that Neisser's organism should be incriminated; without any doubt

it is frequently associated with other microbic species, but its almost constant presence in the follicles and diverticula of the urethra and glans, proves that it must play the most important part in the etiology of these complications.

It may now be asked at what time during an acute gonorrhoea infection of the follicles and diverticula takes place, and in reply to this I would say that it is at the height of the disease, that is to say, after the first week. It is usually at this time that the complication is noticed by the patient; but, since the inflammation of the urethral canal gives rise to a more intense symptomatology, the attention of the patient is quickly distracted from the former. In rarer cases these complications are discovered a long time after the gonorrhoea, but it is not probable that this is due to a fresh contamination, it is more reasonable to believe that, at the time of the first attack, the follicle or the urethral and periurethral glands were involved, and that the virulence of the gonococcus, hidden in these repairs, becomes exaggerated at a later date.

The inflammatory process of acute gonorrhoea arises in the fossa navicularis and progressively invades the urethral canal downwards. All the urethral glands participate in the inflammation and contribute to the formation of pus. At this time the gonococcus, as well as the ordinary pyogenic bacteria, will be found in the urethral secretions. It is certain that, during this inflammatory participation of the entire glandular system of the urethra, one should find Neisser's diplococcus in the culs-de-sac of these glands, besides the ordinary microbes of suppuration; in point of fact, bacteriological examinations made of the secretions coming from these glands have demonstrated that they contain the gonococcus. Infection of the follicles and glands of the urethra consequently takes place by direct penetration when the gonorrhoeal pus passes over the excretory openings of these glands.

As far as the exourethral glands are concerned, that is to say Tyson's glands and those of the coronary sulcus, the extension of the gonorrhoeal process takes place the same way; these glands become infected by the purulent stagnation taking place on the glans and in the folds of the prepuce.

The extension of the gonorrhoea to the accessory ducts of the glans, meatus and frenum, can be explained by the same mech-

anism, and it is at this à propos that in the large majority of cases the existence of these diverticula is discovered.

One can easily conceive the difficulty experienced in drying up a urethral discharge when it is complicated by an inflammation of the glands and paraurethral ducts. If this extension of gonorrhoea is misunderstood, all therapeutic efforts directed to the urethral canal will not accomplish the end, since this secondary infection, on account of its seat, escapes the influences capable of modifying the urethra. From this arises recurrences of the discharge and chronic gonorrhoea which is stubborn to every form of treatment and discourages both the patient and the physician.

Such is the pathogenesis of inflammation of the follicles and diverticula, but it is only proper to add that occasionally the follicular or diverticular inflammation may be primary, and, in point of fact, quite a number of cases have been reported where this process has arisen before the appearance of the urethritis or even without the occurrence of the latter. Finger, Feleki, Jadassohn, Touton, Reichmann, Horvath and Lanz have even made allusion to cases where the urethra was absolutely healthy; the diverticulum, however, became gonorrhoeal, although the infection did not extend to the canal. In these particular cases, one was perhaps dealing with a revival of a former gonorrhoea which had become localized to those points where the gonococcus had become stationed and was awaiting the occasion to exalt its virulence. However this may be, such cases are quite infrequent and nearly always the follicular, glandular and diverticular complications arise from a concomitant urethritis.

It is especially at the lower aspect of the penis that folliculitis is met with. The lesion presents itself in the form of small hard and rounded tumors which are slightly painful, or not at all so. By palpation they feel like lead shot of various sizes; they are distinctly limited and included in the walls of the organ; in a large majority of cases the skin is not adherent over them; the patient is hardly, if at all, inconvenienced by their presence and it is only by rather hard pressure that these small tumors give rise to any pain. The latter, however, is more intense if a folliculitis is undergoing an evolution towards perifolliculitis; in this case the neighboring tissues are involved, because the in-

flammatory process extends in depth. In these conditions the skin loses its elasticity and mobility. At this time the excretory orifice of the follicle appears to be obliterated and if the process does not regress a small abscess will form; the tumor becomes considerably increased in size, is hard and painful, while the skin is reddened and thin; then fluctuation becomes evident and pus makes its appearance, either through the skin or by way of the urethral canal. The evolution of a folliculitis may even extend further and, if the abscess breaks through the skin, an external blind fistula may result. The opening may take place both into the urethra and through the skin, thus forming a complete fistula. Georgiades relates several examples and in a recent work by Sellei similar cases are alluded to.

The symptomatology of diverticulitis of the meatus as described by Diday has remained classic and I will merely transcribe it here. "If one closely examines the urethral orifice one will occasionally encounter in its neighborhood a lesion very interesting to study. A narrow opening will be seen at one of the borders of the meatus, and if the glans is pressed between the fingers, from behind forwards, a tiny drop of liquid will be seen coming from this opening, possessed of all the physical characters of the co-existing urethral discharge. If this opening is sounded by a fine needle, the instrument will usually penetrate to the depth of from 3 to 6 mm. and in direction nearly parallel to the urethral canal. By questioning and examining the patient you will learn that this lesion occurred at about the same time as the gonorrhoea; that the aspect of the borders of the opening exactly represent those of the meatus itself, both being red, tumefied, painful and shiny, or, on the other hand, pale and indolent, according to whether or not the gonorrhoea is at its acute or chronic period; no urine makes its exit by this small opening; if the patient has had several gonorrhoeas the same accident invariably is reproduced, having the same seat and the same type."

In most cases the pain is slight and the inflammatory phenomena little marked; however Diday pretends that, in other cases, the symptoms may be more severe, and in one instance he met with diverticular gonorrhoea which was more painful than the process in the urethra. "The glans became hot, swollen, tense and extremely tender on pressure, even to friction of the

clothing, and a few days of rest were absolutely necessary in order to cure this process."

The meatus, however, is not the exclusive site of diverticulitis; it has already been stated that this might arise often on each side of the frenum in Tyson's glands. Both cases reported by Lagneau are proofs of this and in each instance the process was represented by small, hard, movable tumors, giving rise to little pain, which opened and gave exit to a little pus through a small whitish orifice in the neighborhood of the frenum. However, suppuration is not the necessary outcome in instances of diverticulitis of the frenum, and quite frequently these small tumors do not go on to abscess formation. They remain for a long time in the same condition, and, if they undergo resolution without inflammatory symptoms, a mild induration will simply remain indefinitely. Sometimes also, under the influence of excess at the table or coitus, the inflammatory process, which has been latent for a long time, lights up afresh, and is then accompanied by all the ordinary symptoms of inflammation.

In the case of the patient which I will now report the tumefaction, which was felt on the under aspect of the glans, was red, somewhat tense and extended by a thin cord, which could be very easily felt by palpation, towards the urethral canal; pressure was not painful, and the patient was little troubled by the lesion. The symptoms were never very acute and operation was only decided on in order to do away with the suppuration which was rebellious to all treatment, and in order to avoid the risk of possible contamination.

L., 28 years of age, entered the Suburban Hospital, service of Prof. Forgue, March 5, 1903. He had had several gonorrhoeas, the last about a year ago. After a month of treatment, when all the acute phenomena had disappeared, there still remained a considerable quantity of pus voided by the meatus. Little by little, a small reddish tumefaction developed at the under aspect of the glans, about 1 centimeter from the meatus and tangent to the left side of the frenum. It slowly became tense. At this time the patient noticed that between this point and the urethra a small cord-like process was perceptible on palpation, slightly tender, and that by pressure upon it a drop of pus appeared at the meatus; on the other hand, all attempts at exploration and cathet-

erization of this supposed diverticulum remained fruitless and it was impossible to make a Bowman's sound introduced into the urethra penetrate in the direction of the cord.

As this condition persisted the patient incised a small projecting tumefaction near the frenum, giving exit to a little pus, but the incision closed rapidly and the flow of pus persisted.

When the patient entered the hospital the presence of an indurated cord, occupying the situation already mentioned, was distinctly felt. The discharge of pus was not abundant, but frequently a drop made its appearance at the meatus. The latter presented an interesting peculiarity, namely that it was very narrow. Diagnosis: Gonorrhoeal diverticulitis.

Operation. Injection of 4 cc. of a 1% solution cocaine on each side of the frenum and in the glans, as well as around the meatus and near the fibrous cord. A Beniqué was placed in the urethra in order to facilitate dissection. An incision 1½ cm. in the median line over the frenum was made, circumscribing the lower end of the indurated cord, at which point no orifice was perceptible; then a very careful and minute dissection of the fibrous cord was made up to the urethra, which was then slightly excised and sutured. Hemostasis. Suture. At the same time the meatus was incised. Dressings; sound à demeure.

The patient left the hospital ten days later, the incision being almost cicatrized. The borders of the meatus were not quite healed, but the discharge of pus had completely ceased.

If, during a gonorrhoea, Littré's glands and the crypts of Morgagni are examined it will at once become evident that their orifices are considerably swollen and more dilated than normally. From the histological point of view it will be seen that the gonococcus has become wedged in between the cylindrical epithelial cells; there is also a leucocytic infiltration which becomes more and more dense as the cohesian of the epithelium diminishes; the cavities of Littré's glands and Morgagni's crypts are encumbered with numerous polynucleated leucocytes, while their orifices are plugged with desquamated epithelial cells. When the gonorrhoea has passed to the chronic stage, the glands considered as invaginations of the mucosa, undergo the same pathologic process, that is to say, as in the case of the urethral mucosa, there is a transformation of the cylindrical epithelium into the pavement form.

This is all that was known relative to the pathology of gonorrhoeal infection of the urethral glans and diverticula. It is only during the last few years that the question has been well studied and among all the authorities who have occupied themselves with pathologic researches along these lines, I would particularly mention the memoir published in 1902 by Audry in the *Journal des maladies cutanées et syphilitiques.*

On the other hand Prof. Bosc was good enough to give me the report of his microscopical examination of the diverticulum excised in the above case: "The little tumor was fixed in a saturated solution of sublimate. Sections carried through the middle part show a duct of fairly large dimensions, one of the extremities becoming ramified and surrounded by irregular cavities, more or less filled by epithelial cells. Nearly all these cavities show digitations communicating with the lumen of the canal, communications which are more or less apparent according to the direction or the depth of the diverticula. However, just at the periphery very minute limited cavities are encountered, which appear to be completely isolated from the rest.

"With a low power the lining epithelial cells lie on a basal membrane which is not distinct and represent the general arrangement of Malpighi's layer with very apparent, but narrow, papillae and with a blood supply similar to that met with in a papilloma. Around the duct and its diverticula is a layer of cells having an embryonal aspect and presenting numerous capillaries. The connective tissue forming the framework of the tumor is composed of fibrous tissue, including numerous dilated vessels, with hypertrophied endothelium and surrounded by a cuff of proliferated epithelial cells.

"With a high power, the principal duct was found composed of an epithelial lining made up of large cells placed in from ten to fifteen superposed lines. The basal cells are prismatic; above are polygonal cells presenting all the characters of Malpighi's cells. Then these cells become swollen, transparent and undergo a colloidal degeneration so that the filaments are no longer apparent. Near the lumen of the canal, the large cells, which have taken on very irregular shapes on account of their compression, become isolated and free. At certain points the degeneration is perhaps more horny than colloid, so that the desquamated

cells appear flatter. The desquamation is extremely marked in the lumen of the duct; the cells are mixed with polynuclear leucocytes, although the latter are few in number. It is easy to follow the passage of these polynuclears through the epithelial cells; they come from the vessels situated in the connective tissue which surrounds the epithelial tract. This connective tissue zone is formed by a tissue with rather lax meshes, in which numerous capillaries are found presenting very hypertrophied endothelial cells. It gives rise to papilliform prolongations which form irregular projections surrounded by large capillaries, so that the general characteristics of the picture are that of a commencing papillomatous proliferation. The meshes of the connective tissue are filled with enormous cells, due to the hypertrophy of the endothelial cells of the connective tissue spaces, as well as plasmazellen and various sized mononuclears. At certain spots quite a number of polynuclears are seen. One of the most interesting points noted is the thickness of the basal membrane, the very active proliferation of the epithelial cells, characterized by the piling up of prismatic cells, their transparent aspect, size, large nucleus, and above all by the very large number of karyokinetic figures, disseminated in the prismatic and polygonal cells.

"The same structure is met with in the diverticulum surrounding the deeper end of the duct. The same layers of prismatic and polygonal epithelial cells exist with horny and colloidal degeneration of the superficial cells and a marked desquamation; at the periphery the same papillomatous formations are encountered, as well as a zone of infiltration of embryonal cells. But, as one goes towards the depth the phenomena of hyperplasia become more marked; the deep epithelial cells have a still greater tendency to infiltrate the connective tissue, so that the papillomatous aspect is still more pronounced; karyokinesis is more pronounced, while the polynuclear infiltration is very limited.

"Just at the periphery, cavities corresponding to the lymphatics, or at least distended connective tissue spaces are seen, in which there are many free large epithelial cells; in the neighborhood of these spaces others may be found which are completely filled by proliferated epithelium closely packed together, without any polynucleosis or mononuclear infiltration in the neighboring connective tissue.

"To sum up, the specimen represented a digitated diverticulum having an epithelial lining of the Malpighian type, representing at the same time evidences of a subacute inflammation of the polynuclear type, and, on the other hand, evidences of karyokinetic epithelial proliferation, with hypertrophy and colloidal degeneration, ending in the increase in the size of the pre-existing digitations and in an infiltration of the neighboring spaces. It is this epithelial proliferation which forms the tumor, while the histological characters met with leads one to believe that it is undergoing an evolution towards epithelioma."

The results of the examination of this diverticulum coincide partially with those obtained by Audry. However, in Prof. Bosc's notes, there is a point which, I believe, has not been pointed out before, namely, a karyokinetic epithelial proliferation indicating the tendency of the new formation to evolute towards epithelioma.

Gonorrhoeal folliculitis and diverticulitis are complications which give rise to others. As I have already said in the preceding pages, and as one may see by going through reported cases, the most frequent complication is abscess; the tumor becomes red, soft and fluctuating, and finally breaks externally. In the more fortunate cases the opening closes and everything ends, but a fistula may follow the abscess, whose obliteration is sometimes very difficult to bring about. In 1894, Feleki admitted the occurrence of fistula having a follicular origin, a fact which would seem to uphold what I have said.

In 1896, Audry called attention to gonorrhoeal infection of Tyson's glands situated in the balano-preputial fold and he questions whether the gonorrhoeal infection of these glands was not propagated to the neighboring lymphatic follicles, giving rise to a lymphatic folliculitis in one case which came under his notice. The process was characterized by "the existence of a small nodule whose size varied from a large pin's head to a small pea;—the small tumor was indolent.

"It presents for that matter, a particular character which allows one to recognize its nature; it appears to extend by a hard cord which, to the feel, has exactly the consistency of uncooked macaroni. This cord starts from the nodule, at which point it attains its maximum size. It extends in diminishing, over an

extent of from 3 to 4 cm., and becomes directed towards the dorsal aspect of the penis; evidently it is a lymphatic cord having a peculiar aspect, becoming attenuated and disappears. It is also very movable and indolent.

"The lesion progresses for several weeks and then ends by progressively disappearing. It cannot be doubted that it is an inflammation of the lymphatic follicles which was first mentioned by Neumann in the coronal sulcus of the dog and which Finger found in man. The infection has its starting point in the follicles and extends for a few centimeters along the lymphatics. The constant association with a frank gonorrhoea would lead naturally to a conclusion that it is due to this and consequently to the gonococcus, although this last point is as yet doubtful."

There is still another complication without doubt rare, but which has been mentioned; I refer to the possible urinary infiltration of a glandular follicle which has been infected by a gonorrhoea. In this particular case the follicle undergoes abscess formation and opens freely into the urethra. During micturition the urine enters into the abscess pocket and infects it.

The diagnosis of gonorrhoeal folliculitis and diverticulitis is, in the majority of cases, an easy matter. There are, however, instances where some hesitancy is permissible. Thus, it is often somewhat difficult to differentiate the nodules formed by inflamed follicles from those encountered on the dorsal aspect of the penis in gouty and diabetic subjects. The seat is the same and the tactile sensation is identical in both. It is only when the patient's antecedents do not reveal the occurrence of gonorrhoea that the arthritic or diabetic nature of these nodules may be suspected.

The mistake of diagnosing a calculus lodged in the urethra for a folliculitis would probably never be made, because the patient's story of the symptoms will show that they were very acute and questioning will easily allow one to recognise the symptomatology of urinary lithiasis. Then again, in the case of a calculus the stream of urine is interrupted and there is urethrorrhagia.

Vegetations of the balano-preputial sulcus are so well-known that it is superfluous to refer to them and they could never be mistaken for inflamed Tyson's glands. It is only on account of their possible coincidence with gonorrhoea that they should be

mentioned, but their aspect is so characteristic that they could never be mistaken for anything else.

It is more difficult, at first sight, to make a diagnosis between a fistula of the penis due to a stricture or a traumatism and fistulous tracts resulting from abscess formation in a follicle or a paraurethral diverticulum. The fistulae resulting from stricture or traumatism are larger and deeper, while the other types are extremely fine and less deep; and still more, the preceding folliculitis would not have escaped the patient's notice.

The prognosis of these gonorrhoeal complications rests upon what has already been said in the preceding pages and without being too pessimistic one should be rather reserved. Without doubt, every instance of inflamed follicles will not result in suppuration and many have a tendency towards induration; but, even in the latter eventuality, one is never sure that the indurated follicle does not contain the gonococcus; the organism may remain quiet for a long time, because in one case inflammatory phenomena reappeared only fifteen years after the gonorrhoea, but more frequently under the influence of a genesic excess or an overindulgence at the table, its virulence becomes exalted and the inflammatory phenomena recommence. It is certain that the patient is constantly menaced by reinfection and, in many cases, the numerous gonorrhoeas that are found in the antecedents of a patient are only the expression of an old secretion which becomes lighted up. Consequently, such a patient is both for himself and others a perpetual source of contagion.

As has already been said, no treatment is asked for by the patient for folliculitis and diverticulitis complicating gonorrhoea and from this fact it frequently happens that a cure is effected by induration and sclerosis. But in other cases a constant suppuration becomes established and it is then that patients ask for treatment, which should be an energetic one.

Several procedures have been advised; for diverticula of the meatus and paraurethral ducts which have become infected by gonorrhoea cauterization with a fine thermocautery point may be resorted to so that the seat of the suppuration is destroyed. If the small excretory duct will not allow the point of the thermocautery to enter Diday's procedure may be resorted to, consisting in the introduction of a needle which is afterwards heated.

Cauterization with nitrate of silver may also be employed and to do this the solution is introduced into the diverticulum on a fine wire. It is first heated and then coated with nitrate of silver and allowed to cool and then the diverticulum is cauterized.

Janet irrigates these cavities by means of a syringe ending in a fine straight or curved needle according to the case, or with Anel's syringe. This procedure merits being mentioned because it is very rational, but it requires special instruments and an address that everyone does not possess. When it is necessary to irrigate a diverticulum which opens into the lumen of the urethral canal it can only be accomplished by the use of the endoscope.

And, lastly, in the large majority of cases it is surgical treatment that should be resorted to, because it is surer in its results and far more rapid. The diverticulum should be excised completely. For a few days following the operation, a permanent catheter should be inserted in order to avoid reinfection of the urethra at the point of incision. Folliculitis usually requires no treatment and induration is the usual manner of termination. However, if the follicle undergoes abscess formation the pus should be evacuated, the cavity cauterized, or preferably excised.

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PRELIMINARY NOTE ON EPIDIDYMOTOMY FOR BLENORRHAGIC EPIDIDYMITIS. BASED ON 65 CASES.[1]

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THE greatest and quickest relief in the treatment of blenorrhagic epididymitis is accomplished by epididymotomy.

Like appendicitis, this affection ought to be considered a surgical one. In its evolution, the morbid process is contained in a close cavity and the septic secretions cannot be drained. In all cases, we have pain, fever, swelling, and a decided leucocytosis from 12,000 to 27,000. Once epididymotomy is performed, it is a surprise to notice its good effects; the pain stops, the fever falls, leucocytosis subsides; there are no relapses, and the cure is obtained rapidly.

In going over the history of this affection as far back as 1838, we find that orchitis and epididymitis,—if not the same disease, at least were subjected to the same treatment.

At that time Ricord said: "That there is no blenorrhagic affection of the organs contained in the scrotum without a swelling of the epididymis." He further demonstrated that it was not the testicle that was primarily affected, and that if it did become involved, it was only by propagation, and to a small extent only, the chief lesion being in the epididymis.

In 1876, Reclus proved that the periepididymitis is greater than the epididymitis itself. To-day, we find the lesions begin by an endo-deferentitis, and are followed by endo-epididymitis, interstitial epididymitis and a predominant periepididymitis.

Of all the parts of the genital appartus that blenorrhagia affects, the epididymis shows us the most constant and the deeper lesions; it is increased in volume two to four times, and in its cavity we find small nodules of the size of a lentil, or of a pea, con-

[1] Read before the Pacific Coast Branch of the American Urological Association, [illegible]

taining a puriforme liquid; these nodules are nothing more than abnormal dilatations of the epididymis, plugged with a mass of various leucocytes imbedded in coagulated serum. The tubes appear permeable. In some of the tubes, the epithelial lining has desquamated, the continuity is broken, and the pus cells have wandered into the adjoining connective tissue. This connective tissue is quite heavily infiltrated with lymphocytes, its blood vessels injected, and some of its fibrillæ forced apart by serum transudate.

The treatment of this affection was identical from 1857, in the time of Curling and Gosselin, with what it was in 1900. It consisted of rest, antiphlogistics, anodynes, refrigeration, compression, tapping of the vaginalis (Velpeau), incision of the testicular albuginea (Vidal de Cassis).

Up to this latter date it was a timid treatment, a disarmed expectation sacrificing to atrophy and sclerosis a muscular apparatus so necessary to the progression of the sperm.

In October, 1903, Baernaman, assistant of Professor Neisser, treated 28 cases of epididymitis by puncture and, in the liquid aspirated he found the gonococcus; he found also that the serum of these patients had often the power of agglutination for the gonococcus. The results after the puncture were cessation of the local pain, disappearance of the sensation of tension, fall of the fever. No accident followed the puncture; the extreme pain was the only objection. No mention is made by him of leucocytosis, at least I have not read it in the translation.

In April, 1905, Belfied of Chicago in an article in the Journal of the American Medical Association, entitled: "Pus Tubes in the Male and Their Surgical Treatment," advocates the incision of the epididymis and its drainage by stitching the cut edges of the cavity to the cut edges of the skin.

Without asking priority for the operation, which has been witnessed by many of my assistants and many doctors in various hospitals, and at dates going as far back as 1897, as shown by the records of the French Hospital, I submit to-day what I consider to be a contribution to the surgery of this affection.

In 1897 I performed my first operation at the French Hospital with the following technic:

I chose the ligamentum scrotalis for the incision. We know that the globus minor of the epididymis adheres to the testicle

by a layer of very thick connective tissue; the globus minor of the epididymis is outside of the vaginalis and the respective relations of the globus minor, of the epididymis, of the inferior pole of the testicle, of the vaginals, and of the scrotum are maintained by the ligamentum scrotalis (Pasteau). It is at this point that there is no danger of wounding the testicle or opening the vaginalis. Seizing firmly the swollen indurated nodule of the globus minor of the epididymis in the left hand, an incision, one inch long, is made downwards into the cavity of the epididymis. At first, the swollen nodules were punctured and the walls of the cavity were stitched to the incised skin; later on, I performed partial epididymectomy,—that is, I extirpated the nodules, hoping that anastomosis among the tubules could be made; but, after a case of double epididymitis operated on in this way had resulted in sterility, I changed my technic, and now I perform an epididymotomy, that is, I open the cavity of the epididymis as before stated, expose the nodules, relieve the tension, puncture the nodules if pus is present, and stitch the walls of the epididymis to the skin. The wound is packed with gauze impregnated with 1/10 icthyol and glycerine and the organ well supported. The wound heals in a week; the patient is able to be up in four to seven days. Compare this with the conservative treatment, the recovery is greatly in favor of the epididymotomy.

The cases treated by epididymotomy are getting on well, as quickly as the cases treated by puncture or by extirpation of nodules; further, the danger of sterility by this method is lessened.

I think that there is a great opening for this operation in the army and navy, as the cessation of pain, fall of the fever and ultimate recovery are more quickly obtained than by any other treatment.

In the last eight years I have operated on 65 cases in the following hospitals:

French Hospital 43, City and County Hospital 19, the U. S. Presidio Hospital 1, the Waldeck Sanatarium 2.

The operation is benign; it ought to be performed as soon as the disease is diagnosticated.

I have found the gonococcus in 1/3 of my cases. I never had any atrophy, hernia, necrosis of the testicle, nor any mortality.

URETHROSCOPY.

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THE visual examination of the urethra by means of instruments introduced therein is by no means a new procedure. Desormeaux, in 1853, while the first to bring urethroscopy to the notice of the profession, was not the first laborer in this field. The instruments put forward at this time were peculiarly cumbersome and impracticable, it being necessary that an oil lamp should be attached to the instrument for the purpose of illuminating the field to be observed. Naturally the procedure was received with no marked favor.

Later, Grünfeld by using an independent light and by means of a head mirror reflecting its rays into the endoscopic tube, brought urethroscopy up to the plane of practicability and gave an impetus to its employment and furtherance by other workers in this field. Various instruments of analogous type appeared, notably those of Antal, Schutze, Casper, Leiter and Otis.

But to Nitze must be accorded the credit for the distinct advance over the older types of instruments which made modern urethroscopy possible,—the placing of the source of light in the instrument near the field to be examined. Oberländer, acting on this principle and working in conjunction with Heynemann, an instrument maker of Leipsic, produced the Nitze-Oberländer instrument, a step which proved creative of modern urethral endoscopy. While this instrument was a great improvement on former urethroscopes, it was, as compared with those of the present day, extremely crude.

The source of light in the Nitze-Oberländer instrument was an unprotected platinum loop heated to incandescence by an electric current. The great heat generated necessitated the attachment to the instrument of an apparatus by means of which a constant flow of cold water could be kept circulating in the

hollow plane upon which the wire rested. This rendered the instrument complex and cumbersome and the unprotected incandescent loop made it necessary that the current should be turned off each time before the cotton swabs used in mopping up secretions and making applications could be used. These objections necessarily detracted much from the value of the instrument.

To overcome the objectionable features of the exposed platinum loop, Lowenhardt, of Breslau, invented a small incandescent lamp to take its place but it, too, proved productive of so much heat that it was impossible to put it to practical use without the addition of a cooling apparatus.

The final and crowning step, in urethroscopy,—the advent of the low tension mignon lamp with a minimum of heat production,—must be credited to America. We believe that this achievement is due to the suggestions of Valentine, of New York, and carried out by Preston, an electrician, of Rochester, though credit has erroneously been given to Koch, of Rochester, and the instrument produced at that time, 1899, bears his name. In this instrument the light-carrier was sheathed in an auxiliary tube placed on the floor of the endoscopic tube and while the urethroscope, taken as a whole, was a marked improvement over those formerly in use, still the projection formed by the auxiliary tube made it awkward of insertion and productive of discomfort to the patient. A urethra which would readily admit a No. 28 sound, Charrière scale, would hardly permit of the introduction of a No. 26 urethroscope while the actual lumen of the endoscopic tube was considerably less.

At the present time there are three distinct types of urethroscopes,—those which have the source of light in the form of the cold lamp within the tube, those which have the light projected into the tube from without and those to which the air-dilating principle has been applied. The Guiteras, Chetwood and Valentine instruments are the best representatives of those having the source of light within the tube. The Otis urethroscope is by far the most satisfactory instrument having the light without the tube.

The Fenwick instrument, as modified by Schall, has in the past had its supporters among those who preferred the air-dilating type of urethroscope but has failed of greater acceptance by reason of the fact that the source of light is outside the tube and

the instrument, as a whole, is cumbersome. The author has devised a urethroscope which he believes obviates the objectionable features of the Fenwick instrument and still retains its advantages. The endoscopic tube conforms to the general lines of the Guiteras tube. At its proximal end it is attachable by means of a bayonet lock to the light-carrier head. The handle of the light-carrier contains a spring making it self-adjustable to any size of tube. The light-carrier head also holds the valve for attachment to the dilating bulbs. An ocular window fits the light-carrier head by a bevel joint. When assembled the instrument is air-tight and readily permits of thorough dilatation of the urethra.

Following the idea of Kollmann, the author has had certain instruments constructed for intra-urethral operative work. These instruments may be used through an operative window which is fitted with a metal adjustable gland containing a rubber gasket, thus assuring an air-tight contact and yet allowing perfect mobility on the part of the operating instrument.

The advantages of urethroscopy under air-dilatation are many. The urethroscopic picture presented by the non-dilating urethroscope is limited to a very small collapsed area at the distal opening of the tube. To obtain a clear understanding of the conditions present it is necessary to spread out the mucosa by manipulation of the tube. This produces a certain amount of trauma and, in a sensitive urethra, causes considerable discomfort. If the operator has to work through a No. 25, French, meatus which has a No. 30, French, urethra beyond, this manipulation must be increased. The difference in calibre is decidedly marked in the bulbous and prostatic portions and the difficulty in obliterating the folds of the urethra is enhanced.

If the urethroscope is brought beyond a point which it is desirable to examine further, it is necessary to replace the obturator before pushing the tube on into the urethra. In a urethra which has a normal calibre of No. 30, French, in the mid-pendulous portion, we expect a prostatic portion of about No. 45, French. The obliteration of the voluminous folds found in this region and a comprehensive examination are impossible without considerable trauma. The prostatic urethra bleeds readily and even a slight amount of bleeding obscures the visual field.

All of the above difficulties encountered in simple urethro-

scopy are obviated by air-dilatation. An extensive mucous surface is brought into view and points in a considerable area may be contrasted. The air balloons up the urethra and the minimum of manipulation is necessary. If the urethroscope is brought beyond a point to which it is desirable to return, the air dilates the urethra beyond the distal extremity of the tube which may be pushed back without difficulty or discomfort.

The endoscopic picture presented under air-dilatation is essentially different from that seen through the ordinary urethroscope. The air obliterates the stellate folds and from a small collapsed area immediately at the distal end of the instrument, the picture widens into a fairly extensive tubular view. Every point on the walls of this tube can be accurately observed without manipulation and different areas may be compared.

The indications for the employment of the urethroscope may be put down as any subacute or chronic urethral lesion. There is absolutely no means other than urethroscopy by which we can obtain a comprehensive working basis in such conditions and it should be considered a *sine qua non* in the diagnosis,—a rule to which the author believes there can be no exceptions.

The number of tubes required varies as the amount of endoscopic work to be done. For all practical purposes Nos. 23, 25, 27, 29 and 31, French, will suffice for a good working urethroscopic outfit. In a series of three hundred measurements made by Kollmann and Oberländer, it was found that about two per cent. would not admit of the use of a No. 23. In ten per cent. it was necessary to use a No. 23 while twenty-five per cent. required a No. 25. In the remaining sixty-three per cent. Nos. 27 and 29 were available. On one patient alone could a No. 31 be used.

The tube selected should be the largest one which will pass comfortably into the urethra. It should be thoroughly sterilized and no method of sterilization is as satisfactory as boiling. The modern urethroscopes can be so sterilized without damage.

The urethra, especially at the first examination, should be cocainized and for this purpose the author has found a one per cent solution of sufficient strength to produce analgesia. He has never seen the slightest toxic effect from a solution of such strength.

There is but one objection to the use of cocaine. It contracts the peripheral blood vessels and the mucosa, as a result, has a slightly anemic appearance. Keeping this in mind, the operator should have no trouble in diagnosis from this cause.

The position the patient should assume during an examination should be that which is comfortable for the patient and which will permit of ease in manipulation on the part of the operator. Personally, for anterior urethroscopy the author prefers the recumbent posture while for posterior work the position advocated by Leiter is admirable.

The glans and prepuce should be thoroughly cleansed by washing with some antiseptic soap and water and the penis isolated from its surrounding parts by means of a sterile towel with a central hole. The urethroscopic lamp is tested to see that it is working satisfactorily and the rheostat is turned to the point where the necessary brilliancy of illumination is obtained. The obturator is inserted and the tube well lubricated. As a lubricant, the author prefers a sterile preparation of Irish moss, of which there are several excellent ones to be had in the convenient collapsible tubes.

The penis is grasped in the left hand and the prepuce retracted. The lips of the meatus are held apart by retracting the glans on each side with the thumb and forefinger of the left hand and the urethroscope is gently inserted until the resistance met with at the anterior layer of the triangular ligament is encountered. If the intention is to confine the examination to the anterior urethra, the operator stops at this point. The obturator is withdrawn and excess secretion is gently mopped up with small pledgets of sterile cotton attached to applicators. These applicators are made of wood or metal. The wooden ones are in every way preferable. Before each examination a number are freshly prepared,—from twenty to thirty,—and each applicator so tipped with its cotton pledget is used but once. This facilitates the examination greatly as it is unnecessary to prepare fresh applicators during the seance. Again, should the applicator be not thoroughly tipped with the cotton, danger of injury to the mucosa from the point of the wooden ones is much less than from those made from metal.

The urethroscope is slowly withdrawn, each successive field

being closely studied. The points to be observed as being of diagnostic value are (1) the central figure and the manner in which the urethra falls into folds, which varies in different parts of the canal. (2) The vascularity of the mucosa. (3) The appearance of the mucosa as to lustre. (4) The appearance of the orifices of the lacunae of Morgagni and the glands of Littré.

The Elasticity:—Beginning at the bulb, the longitudinal folds are quite voluminous in this region, being more marked on the floor, this discrepancy being accounted for by the bulbar cul-de-sac. As we withdraw the instrument, the folds become less voluminous and the endoscopic picture has a stellate appearance with a punctiform central figure reaching its greatest symmetry in the mid-pendulous portion. From this point forward a gradual change takes place, the punctate central figure lengthening out into a vertical slit. The folds become less pronounced until upon reaching the fossa navicularis, there is an entire absence of such radiating folds.

The readiness with which the urethra falls into folds depends upon its elasticity and the size of the endoscopic tube used, it being readily understood that the larger the tube the less pronounced the folds. The elasticity is greatly impaired in diseased conditions of the urethra and, therefore, this folding is of diagnostic importance in determining the extent of disease and the progress of such lesions under treatment. So great may be the infiltration in diseased conditions that the folds may be almost obliterated and we have instead of the normal infundibuliform picture, a large central opening with stiffened walls standing out from the end of the urethroscopic tube.

The Vascularity:—Normally, this differs in degree in different individuals, being more pronounced in type in the well-nourished and those having well developed organs and, conversely, being poorly marked in anemic conditions and small, flaccid genitals.

The region of the glans is poor in blood vessels and the urethra in this neighborhood has an anemic appearance. Beginning at the navicular fossa, the urethra back as far as the bulb is traversed by minute reddish striae of vessels running longitudinally with numerous ramifications on a background of paler

mucosa, which has a slight yellow tinge. Pathological infiltrations markedly modify this vascularity and to the trained observer such changes are readily detected.

Lustre:—In a normal condition, the smooth epithelial surface combined with the natural vascularity and lubrication of the urethra impart to the endoscopic picture a characteristic lustre. Any pathological change in these three elements materially alters this normal brilliancy, and such alterations are of diagnostic importance.

The Appearance of the Lacunae of Morgagni and the Glands of Littré:—On withdrawing the urethroscope from the bulbar region, the endoscopist encounters just within the bulbar cul-de-sac the two openings of the glands of Cowper. On account of the large number and size of the folds in this region, it is difficult to locate these openings with the ordinary urethroscope but this becomes a comparatively easy matter under air-dilatation. The openings are slightly slit-like and at first observation appear as small reddish dots.

As the urethroscope is further withdrawn, there appear on the superior wall a number of punctiform openings,—varying from seven to fourteen,—the mouths of Morgagni's lacunae. Ordinarily it is possible to pass the point of a urethral probe into these openings. The valve of Guerin, located about 0.015 millimeter from the meatus, is the largest of these lacunae. Their mouths are of the same color as the surrounding mucosa and are not raised above the surface.

Normally, the glands of Littré are not visible through the urethroscope though, in a diseased condition, they become distinctly preceptible and this change is, as a rule, permanent.

Posterior Urethroscopy:—Urethroscopy of the posterior urethra is essentially different from that of the anterior and demands a greater degree of skill in manipulation for reasons which readily suggest themselves.

The normal curvature of the urethra makes access to that part posterior to the anterior layer of the triangular ligament difficult. The prostatic mucosa is extremely delicate and exhibits a pronounced tendency to bleeding, which obscures the field, while the greater degree of dilatability of this region requires considerable manipulation for the obliteration of the vol-

uminous folds. It is practically impossible to avoid traumatism, though this is reduced to a minimum in skilled hands, and for this reason it is inadvisable to urethroscope the posterior urethra unless such a procedure is deemed absolutely essential.

To avoid the difficulties detailed above a number of instruments have been devised. The jointed obturator of Oberländer, constructed so as to approximate the normal urethral curve, has not been received with much favor, while the posterior tube of Swinburne, resembling in general a short curved sound, has found much wider acceptance, though it is open to two valid objections:—the fact that with this instrument it is possible to observe only a limited area confined to the floor of the urethra and that manipulation for the purpose of minute observation of the urethroscopic field is too restricted.

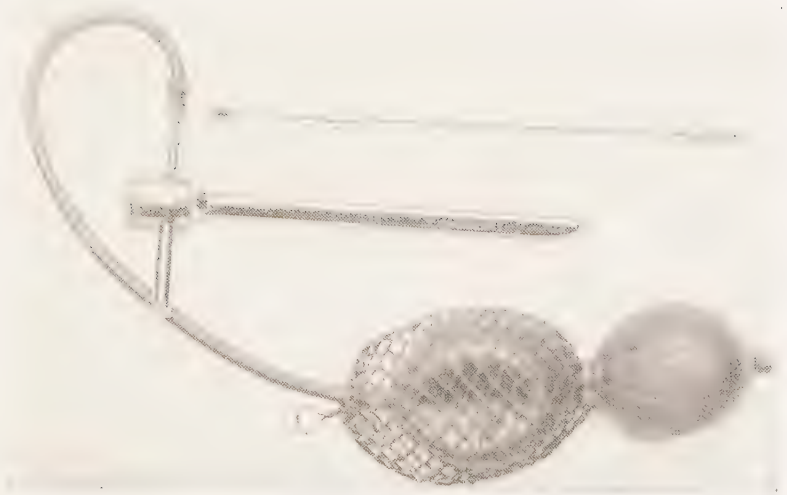
The personal preference of the author is for the straight fifteen centimeter tubes with the air-dilating attachment. It requires no great skill for their introduction with the minimum of trauma and the air-dilating feature obviates the necessity for painful manipulation. It is in this region that the remarkable advantages of air-dilatation present themselves so prominently.

Previous to the introduction of the urethroscope one drachm of two per cent. cocaine solution should be instilled into the posterior urethra and allowed to remain for five minutes, the bladder having been emptied prior to the instillation and the patient urinating again immediately before the urethroscopy.

The urethroscopic tube is inserted as in anterior urethroscopy until the resistance met with at the anterior layer of the triangular ligament is encountered. The external part of the instrument is then depressed with the right hand while the fingers of the left, by pressure over the perineal urethra, elevate the point of the tube from the bulbar cul-de-sac into the membranous urethra. The instrument is then slowly pushed in until it enters the bladder.

The excess secretion is then mopped up and the urethroscope is withdrawn until it enters the prostatic urethra which is readily recognized. If bleeding obscures the field, as it may do even with the most careful manipulation, it is advisable to swab the surface with a solution of suprarenal extract. The resultant blanching of the mucosa must be taken into consideration.

PLATE III—To Illustrate the Article by Dr. Ernest G. Mark.



The points of particular importance to be observed in this region are the general aspect of the mucosa, the verumontanum and the orifices of the prostatic and ejaculatory ducts. It will be noted that the mucosa has a much redder appearance than that of the anterior urethra and has not the peculiar lustre or vascular striations.

The verumontanum varies greatly in different individuals and is also much modified by sexual excesses and disease. In anemic persons whose *vita sexualis* is slight, the verumontanum will be correspondingly poorly developed, and, conversely, in sexually vigorous individuals, the verumontanum will be prominent. Normally it has an extent of from one to two centimetres in the direction of the canal and, in its most prominent part, is of about the size of a lentil, though under the influence of disease and excesses it may assume much larger proportions and become extremely turgescent.

In about the center of the verumontanum will be found the prostatic utricule which has as great variations as the caput gallinaginis. It may be noted as a small depression or as a relatively deep excavation. Its depth has apparently no relation to the size of the verumontanum.

Ordinarily, in a condition of health, it is impossible to see the openings of the prostatic ducts, though in disease they often become distinctly visible, taking on much the same appearance as the orifices of the glands of Littré under similar conditions. The orifices of the prostatic ducts are scattered along the sides of the caput gallinaginis and are from twelve to twenty in number.

The orifices of the ejaculatory ducts are situated forward on the verumontanum on the edges of the prostatic utricule, sometimes being found just within its margins. They are easily seen and are larger than is usually taught, readily admitting the tip of a urethral probe.

In ordinary urethroscopy, the central figure in the prostatic urethra appears as an inverted U, the upward projection being formed by the verumontanum while the superior wall falls around it closely in folds more delicate than those of the penile urethra. In this collapsed condition, a great deal of dexterous manipulation is necessary to examine this region in detail and the

recognition and extent of lesions is rendered extremely difficult. Under air-dilatation the numerous folds are obliterated, the essential manipulation is reduced to a minimum and the different landmarks and lesions are readily identified. There can be no question of its decided advantage in this portion of the canal.

As the instrument is withdrawn, the projection formed by the verumontanum grows gradually less until when the extreme forward portion of the prostatic urethra has been reached, it disappears entirely. The instrument then enters the membranous urethra, the urethroscopic characteristics of which are the great vascularity and the punctiform central figure with numerous delicate radiating folds. It requires no especial description.

THE EFFECT OF UTERINE RETROVERSION ON THE URINARY BLADDER.[1]

By George S. Whiteside, M. D., Portland, Ore.

IT is, of course, well known and has long been recognized, that displacement of the uterus disturbs the normal anatomical contour and position of neighboring organs, particularly the bladder and the rectum, but exactly what these effects are, in relation to the bladder, and how they may occur, is a subject that has not had the attention it should.

In such a brief paper as this, I can do no more than to call attention to a few of the effects and to illustrate by reference to cases.

What are some of the most common effects of retroversion, with or without retroflexion? I say with or without retroflexion because if the whole uterus is retroverted it cannot affect the bladder at all to have a retroflexion also present.

In retroversion the fundus of the uterus is tipped backward against the anterior wall of the rectum. It therefore no longer prevents backward distention of the bladder toward the promontory of the sacrum. Consequently in many of these cases we have more or less dilatation of the bladder in that direction, causing the formation of a saculated portion, or intravesical pouch, behind

[1] Presented at the January meeting of the Pacific Coast Branch of the American Urological Association, January 16, 1906.

the intra-uretral fold, posterior to the trigone. The stretching of the fold of peritoneum between the fundus of the uterus and the fundus of the bladder also favors this same condition. Of eight cases, of which I have notes, of retroversion of the uterus, four had much dilated bladders. One had a capacity of 1000 c.c. All four bladders were much trabeculated. To my mind trabeculation shows either obstruction or else thinning of the bladder wall through atrophy of the detrusor muscle to a greater or less extent. Of the other four of these eight cases, two had bladders of normal size and two were contracted. These latter ought not to be considered in this series, because in both cases the contraction was one due to cystitis of long standing. Consequently, had these bladders not become infected, we do not know whether they would have remained of normal size or become dilated.

When the retroverted uterus falls backward, it usually tips the cervix up against the floor of the bladder. This allows the cervix to press against the inter-ureteric ligament, at the posterior margin of the trigone, and so separate the uretral papillæ by pushing them to either side, and forming more or less of an antero-posterior ridge between them. Of the eight cases cited, seven showed this anatomical change; all the dilation cases, the two otherwise normal bladders and one (the larger of the two) of the contracted bladders. This condition was observed by cystoscopy in these cases. It was therefore impossible to measure exactly the inter-ureteric distance, but it appeared to be from .5 cm. to 1.5 cm. greater than normal.

Another consequence of the pressure of the cervix against the floor of the bladder, and lateral displacement of one or both ureteral papillæ, often is that the pressure is distributed in such a way that it results in gaping or patulency of the ureteric orifice. This was observed on both sides in two cases and on one side in three cases of the eight mentioned. Such a condition renders ascending infection of the kidney quite easy, as is well known.

If, on the other hand, a greater or lesser degree of prolapse is combined with the uterine retroversion we get the condition so familiar to us, known as cystocele, or prolapse of the posterior bladder wall, and sometimes of the bladder floor as well, downward and forward. In many such cases a pocket is formed into which the ureters open, or even if this is not the case, it is a deep

or shallow pocket which is not easily emptied. Some of these conditions are so extreme that the pocket is only connected with the main bladder cavity by a long narrow, slit-shaped canal. In such cases vesical stone is common, and chronic cystitis the rule.

If, instead of prolapse, a decided lateral deviation of the cervix takes place, and especially if such a misplaced cervix is firmly held in its new position by adhesions, it may press upon one or the other ureter, causing more or less obstruction. I have seen one such case. Here the left ureter was almost occluded by pressure of the cervix on the retroverted and right latero-flexed uterus. The left ureter, as a consequence, was dilated to almost the size of the finger and of course back pressure had caused a considerable dilation of the left renal pelvis and calyces.

Where the uterine displacement is caused by traction of adhesions, due to inflammatory disease of the tubes or ovaries, a great variety of deformities of the bladder may result. This is really another subject and too extensive to be more than mentioned in this paper. Zuckerkandle has written several articles calling attention to this matter, but the exact reference has, for the moment, escaped me.

I wish in closing to remark that the one important fact to remember is, that a vaginal examination should always supplement a cystoscopy for the diagnosis of bladder trouble in the female. Such a bimanual examination will often explain conditions which otherwise would be very difficult to understand and interpret correctly. In cases where retroversion exists either pressure or traction will account for all the varieties of anatomical change in the shape or position of the bladder or ureters.

BOOK REVIEWS

Genito-Urinary and Venereal Diseases. By J. WILLIAM WHITE, M.D., and EDWARD MARTIN, M.D. 6th Edition. Philadelphia, 1905. (J. B. Lippincott Co.)

The rapid appearance of the sixth edition of this well-known book is sufficient proof of its excellent qualities. The present volume has been revised in accordance with the most recent doctrines and practice of those eminent in this branch of surgery.

The technique of urologists has not greatly advanced in the past two years, but it certainly has undergone many signal improvements. It has been the aim of the authors to embody all these advances in the present edition and for this purpose many new illustrations have been inserted, while in some instances, particularly the question of prostatic hypertrophy, the sections have been rewritten.

The book is most up-to-date and reliable. Well illustrated, with excellent type and binding, a very practical arrangement of the index, all show much care and taste on the part of the publishers.

The Treatment of Gonorrhœa in the Male. By CHARLES LEEDHAM GREEN, M.B., F.R.C.S. New York, 1906. William Wood & Co., Publishers.

In the pages of this very excellent little book, the author has given the profession an up-to-date account of the present views of the pathology and treatment of gonorrhœa in the male, as well as some of the principal complications of this affection.

We have carefully read the book and find that the teachings therein contained are sound. For example, the writer says in speaking of the treatment of acute urethritis: "How frequently the surgeon, armed with one or two favorite injection formulae, prescribes them forthwith to the unfortunate patient, irrespective of the nature of the urethritis, the stage of the disease, the extent of the mucous membrane involved, and the presence or absence of complications! It is little to be wondered at that so blind a shot should so frequently miss," and Mr. Leedham Green is unfortunately only too right.

In the diagnosis of acute posterior urethritis, we are glad to see that Kollmann's five-glass test is given in detail and the author states that "*the best way of determining the presence or absence of posterior urethritis, in case of doubt is to wash the anterior urethra free from all secretion before the patient passes water. If the urine after this contains pus, it must have come from the posterior portion.*"

This book will be found a safe guide to the treatment of gonorrhœa and should be in the hands of every general practitioner.

Essentials of Genito-Urinary and Venereal Diseases. By STARLING S. WILCOX, M.D., Professor of Genito-Urinary Diseases and Syphilology, Starling Medical College, Columbus, Ohio. 12mo of 313 pages, illustrated. Philadelphia and London: W. B. Saunders Company, 1906. Cloth, $1.00 net.

This little work is a worthy addition to Saunders' Question-Compend Series. In this present work by Dr. Wilcox all genito-urinary and venereal diseases are

fully detailed in the terse language of question and answer, so that the student grasps immediately the point in question. Illustrations are freely used, adding much to the value of the book.

On some points we do not agree with the author. For example, urinary fever is defined as "an acute or chronic febrile movement . . . caused by trauma to some part of the urinary tract," whereas it should be regarded as a mild or severe type of infection, according to the case.

The treatment advised in acute gonorrhœal urethritis is rather complicated, and we think not quite up-to-date, but on the whole the book is good and will be found of much practical value to the student and practitioner.

CORRESPONDENCE.

BOSTON, March 7, 1906.

Editor "THE AMERICAN JOURNAL OF UROLOGY," Boston, Mass.:

Dear Sir: The criticism of Dr. Follen Cabot of New York, concerning a recent article of mine on "Lavage of the renal pelves, in the treatment of lithaemia, pyelitis, forms of nephritis, with notes of illustrative cases," is certainly a most just, considerate, and timely one.

Every statement made by Dr. Cabot is perfectly true. It has been my desire in each and every instance to follow out minutely each step in the diagnosis, treatment, history, clinical aspect, etc., and also in each and every operation to guard against every risk that is liable to spring up. Time enough has not yet elapsed in order to prove the real value of the procedure. My deductions are based utterly upon the improvement made, the disappearing of many symptoms for which relief was sought, and the gain made in the whole physical picture of each case.

I would emphasize the fact that where the invasion proved to be ascending in character, the best results have been obtained. Internal treatment, the diet and environment, all play their part, and all are of the very highest importance.

Lavage is really an addenda to the usual measures, and it appears to me that it gives great promise as to its efficacy. It is my intention at a later date to give a statement of tabulated cases in detail, so that results can be better understood.

Until a greater length of time has elapsed it would be difficult for me to report cases as positively cured.

Meantime, watching each and every patient as carefully as possible, I find that gains are made that appear as if permanent results might ensue for the better. I am greatly indebted to Dr. Cabot for his wishes regarding more minute details.

Cordially yours,

F. M. JOHNSON.

43 TREEMONT STAEET.